

CLAIMS

What is claimed is:

1. An applicator for performing thermokeratoplasty, comprising
an electrically conducting element comprising at least a pair of elongated
5 conductors separated by a selected distance and extending from a proximal
end to a distal end,
an insulator disposed between said two conductors to provide electrical insulation
therebetween,
a thermally conductive dielectric element coupled to said conductors at said distal
10 end, said dielectric element being adapted for positioning on a portion of a
patient's cornea, and
a cooling device thermally coupled to said dielectric element for cooling thereof,
wherein application of an electrical signal across said two conductors at said
proximal end causes generation of electrical energy at said distal end
15 penetrating said dielectric element.
2. The applicator of claim 1, wherein said thermally conductive dielectric
element is formed of anodized aluminum.
3. The applicator of claim 1, wherein said thermally conductive dielectric
element provides an electrically insulating layer between said distal end of said electrical
20 conducting element and the portion of the corneal tissue to which electrical energy is
coupled.
4. The applicator of claim 1, wherein said thermally conductive dielectric
element has a thermal conductivity in a range of about 0.1 W/(m °C) to about 200 W/(m
°C).
- 25 5. The applicator of claim 1, wherein said pair of conductors comprises an
inner conducting tube disposed within an outer conducting tube.
6. The applicator of claim 5, wherein said conducting tubes are disposed
substantially coaxially relative to one another.

7. The applicator of claim 5, wherein said inner conducting tube has an outer diameter in a range of about 2 to about 10 mm.

8. The applicator of claim 5, wherein said outer conducting tube has an inner diameter in a range of about 2.5 to about 12 mm.

5 9. The applicator of claim 1, wherein said pair of conductors comprises an inner conducting rod disposed within a conducting tube.

10. The applicator of claim 1, wherein said electrical conducting element is formed of a metal having an electrically insulating and thermally conducting coating.

10 11. The applicator of claim 10, wherein the metal forming the electrical conducting element can be any of stainless steel, steel, aluminum, brass, or copper.

12. The applicator of claim 10, wherein said coating comprises alumina.

13. The applicator of claim 12, wherein said alumina coating comprises aluminum oxide particles in an aluminum matrix such that a concentration of said aluminum oxide particles varies from said proximal end to said distal end of said electrical conducting element.

14. The applicator of claim 13, wherein the concentration of said aluminum oxide particles reaches a maximum value in proximity of said distal end.

15. The applicator of claim 10, wherein said coating comprises plastic.

16. The applicator of claim 1, wherein the distal end of at least one of said conductors comprises a tip having a contoured surface.

17. The applicator of claim 17, wherein said contoured surface is configured to substantially conform with said portion of the patient's cornea.

18. An applicator for performing thermokeratoplasty, comprising:
a pair of electrical conducting elements separated by a selected distance and
extending from a proximal end to a distal end, said conducting elements
being configured to have a direct contact with corneal tissue at said distal
end upon placement of said applicator on a subject's cornea, and
a dielectric insulator disposed between said conducting elements for providing
electrical insulation therebetween,

wherein application of an electrical signal across said conducting elements at said proximal end causes generation of an electric field at said distal end.

19. The applicator of claim 18, wherein each of said conducting elements comprises a bottom surface at said distal end configured for positioning over the cornea, said bottom surfaces being at least partially coated with a thermally conductive and electrically insulating material.

20. The applicator of claim 18, wherein said coating material comprises anodized aluminum.

21. An applicator for performing thermokeratoplasty, comprising an electrical conducting element comprising at least a pair of elongated conductors separated by a selected distance and extending from a proximal end to a distal end, an insulator disposed between said two conductors to provide electrical insulation therebetween, and a vacuum source having at least one vacuum passage extending to said distal end and configured for applying suction to at least a portion of corneal tissue upon positioning of said applicator on the cornea.

22. The applicator of claim 21, wherein said vacuum passage at least partially passes through said insulator.

23. The applicator of claim 21, further comprising at least a thermal transfer element thermally coupled to at least one of said elongated conductors to regulate temperature thereof.

24. The applicator of claim 23, wherein said thermal transfer element comprises a chamber through which a fluid flows.

25. A system for performing thermokeratoplasty, comprising an applicator including at least a pair of electrically conducting elements extending from a proximal end to a distal end, said conducting elements being separated from one another by a selected distance and being

configured to have direct contact with a subject's cornea when in use, and

an electrical insulator disposed between said electrical conducting elements;

5 a generator for applying a electrical signal having a selected frequency across said conducting element at said proximal end so as to cause generation of a radiation field at said distal end, and
a controller coupled to said generator for applying control signals thereto.

26. The system of claim 25, wherein said control signals cause any of
10 initiating a treatment protocol or terminating a treatment protocol.

27. The system of claim 25, wherein said controller applies a stop signal to said generator when a treatment time associated with a treatment protocol exceeds a threshold defined for said treatment modality.

28. An applicator for performing thermokeratoplasty, comprising
15 an electrically conducting tube extending from a proximal end to a distal end,
a conductive rod disposed within said tube and separated by a selected distance therefrom,
an insulator disposed between said conductive tube and said rod for providing electrical insulation therebetween,
20 wherein said conductive tube and said rod are configured to have a direct contact with corneal tissue at said distal end upon placement of the applicator on a subject's cornea.